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[54] AUTOMATIC AND TRANSPARENT DOCUMENT ARCHIVING

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[51] Int. Cl.[6] H04L 9/00

[52] U.S. Cl. 380/9; 380/18; 707/500

[58] Field of Search 380/9, 18; 358/443, 358/440; 707/500

[56] References Cited

U.S. PATENT DOCUMENTS

4,876,609	10/1989	Ogura	358/443
5,465,353	11/1995	Hull et al.	395/600
5,499,108	3/1996	Cotte et al.	358/400
5,642,199	6/1997	Ukai et al.	380/18
5,717,940	2/1998	Peairs	395/777
5,867,597	2/1999	Peairs et al. .	

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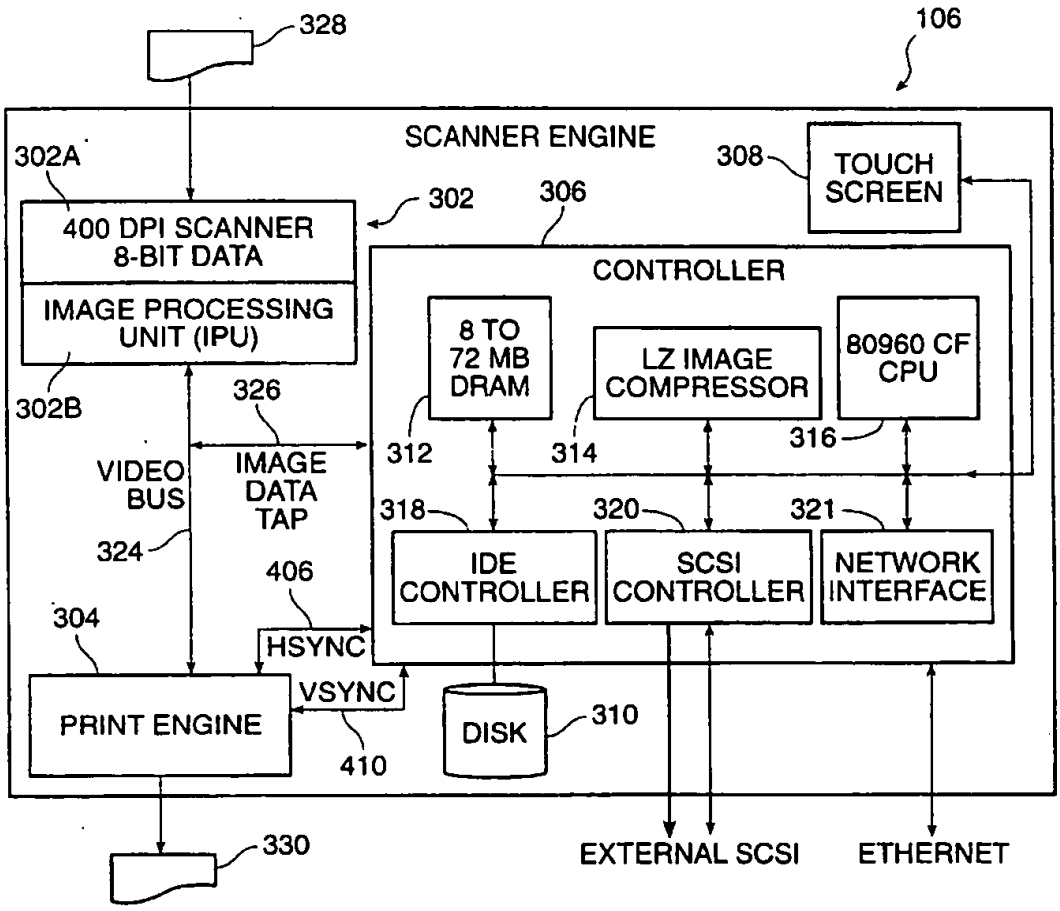
[57] ABSTRACT

An automatic archiving system that makes document archiving largely transparent to the user. In one embodiment, documents scanned in or printed during the course of office equipment operation are automatically archived. For example, an office local area network (LAN) may interconnect a copier, a printer, a fax machine, and a document management workstation. Whenever, a document is copied, printed, or faxed, a document image is archived by the document management workstation without further user intervention. A single user command results in the document being copied and archived, printed and archived, or faxed and archived.

32 Claims, 5 Drawing Sheets



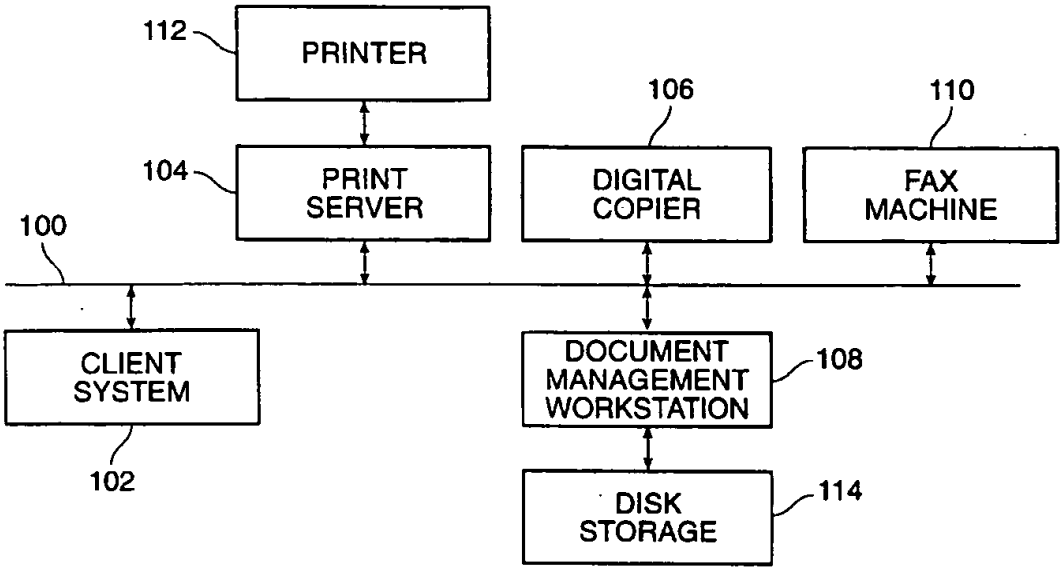

112
PRINTER
106
110
104
PRINT SERVER
DIGITAL COPIER
FAX MACHINE
100
CLIENT SYSTEM
DOCUMENT MANAGEMENT WORKSTATION
108
102
DISK STORAGE
114

FIG. 1

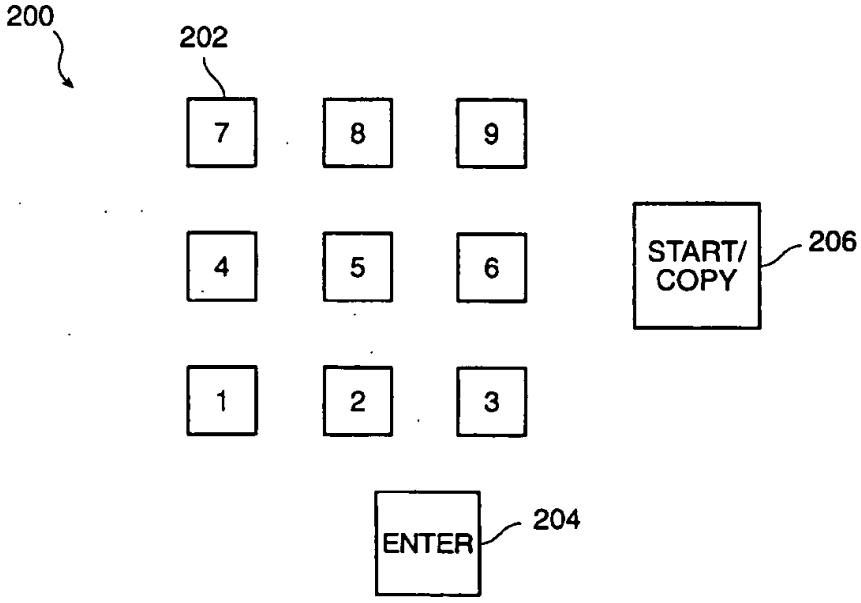

200
202
7
8
9
4
5
6
START/ COPY
206
1
2
3
ENTER
204

FIG. 2

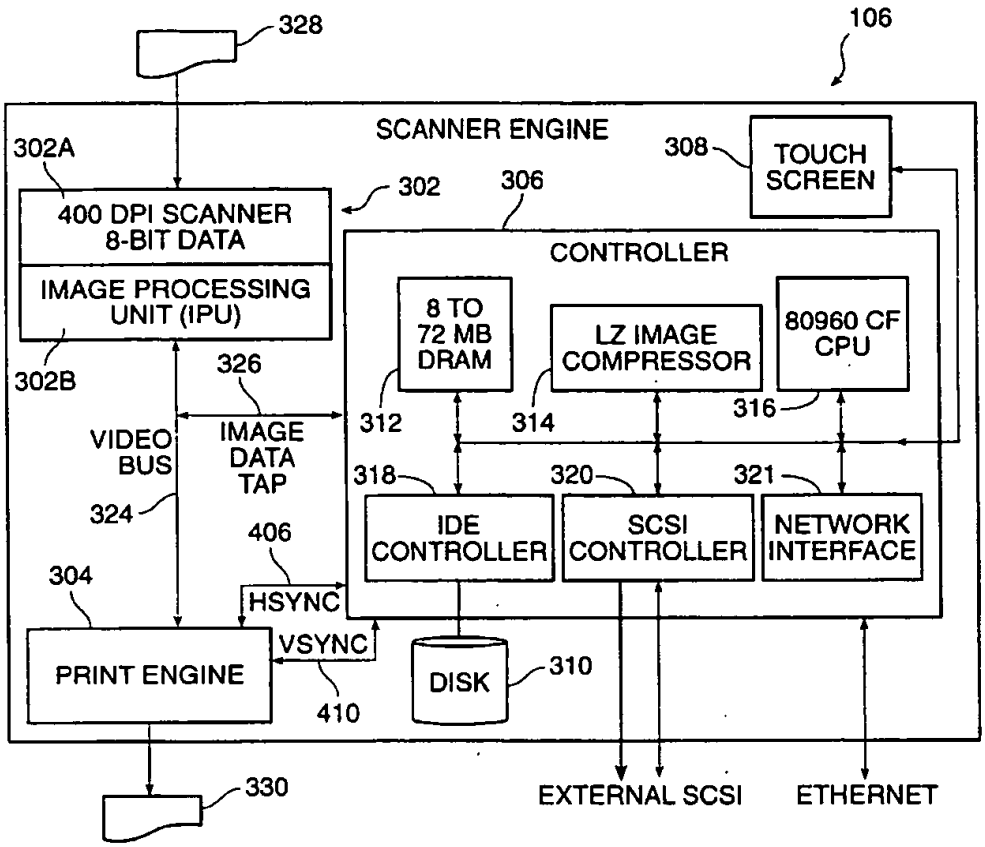

328
106
SCANNER ENGINE
302A
308
TOUCH SCREEN
400 DPI SCANNER 8-BIT DATA
302
306
CONTROLLER
IMAGE PROCESSING UNIT (IPU)
8 TO 72 MB DRAM
LZ IMAGE COMPRESSOR
80960 CF CPU
302B
326
316
312
314
VIDEO BUS
IMAGE DATA TAP
318
320
321
324
406
IDE CONTROLLER
SCSI CONTROLLER
NETWORK INTERFACE
304
HSYNC
VSYNC
PRINT ENGINE
DISK
310
410
330
EXTERNAL SCSI
ETHERNET

FIG. 3

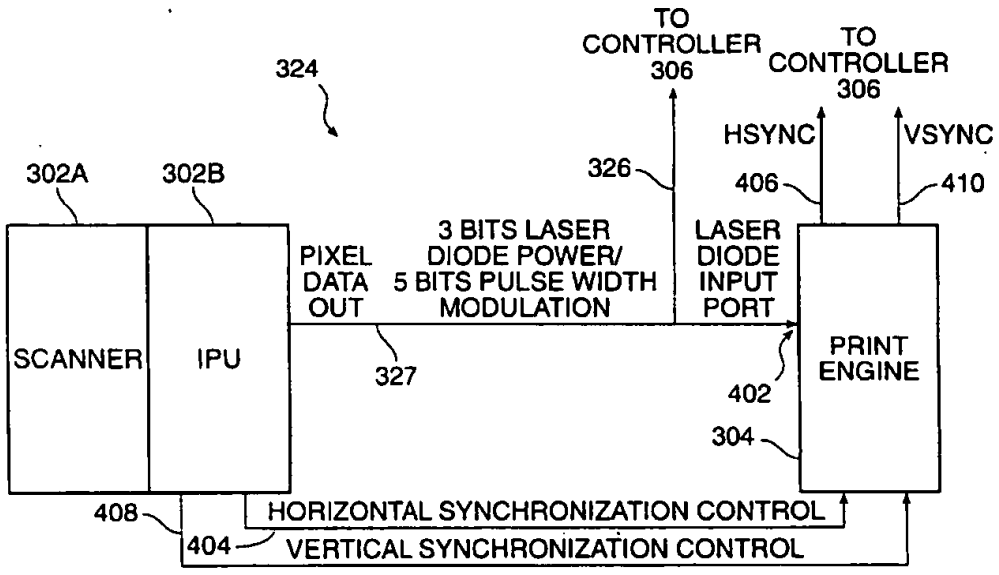

TO CONTROLLER 306
TO CONTROLLER 306
324
HSYNC
VSYNC
302A
302B
326
406
410
3 BITS LASER DIODE POWER/ 5 BITS PULSE WIDTH MODULATION
PIXEL DATA OUT
LASER DIODE INPUT PORT
SCANNER
IPU
327
PRINT ENGINE
402
304
408
HORIZONTAL SYNCHRONIZATION CONTROL
404
VERTICAL SYNCHRONIZATION CONTROL

FIG. 4

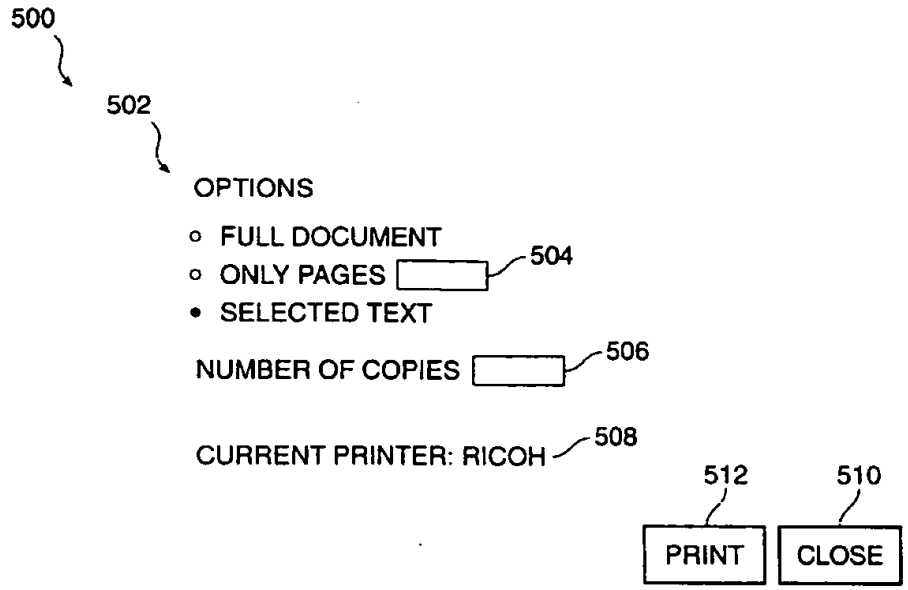

500
502
OPTIONS
FULL DOCUMENT
ONLY PAGES
504
SELECTED TEXT
NUMBER OF COPIES
506
CURRENT PRINTER: RICOH
508
512
510
PRINT
CLOSE

FIG. 5

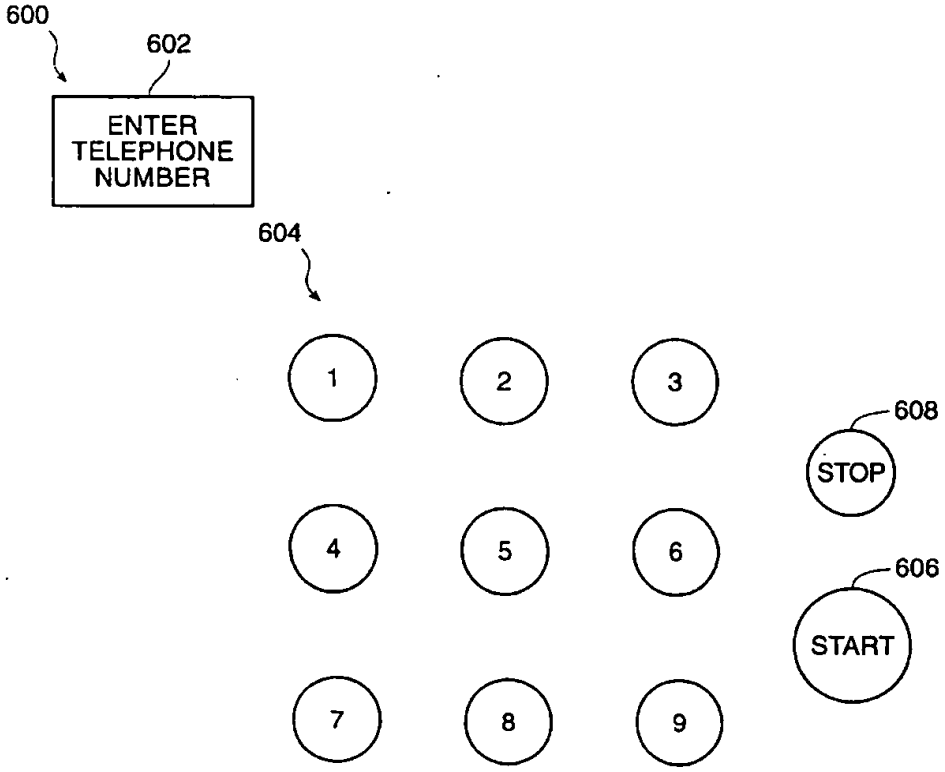

600
602
ENTER TELEPHONE NUMBER
604
1
2
3
608
STOP
4
5
6
606
START
7
8
9

FIG. 6

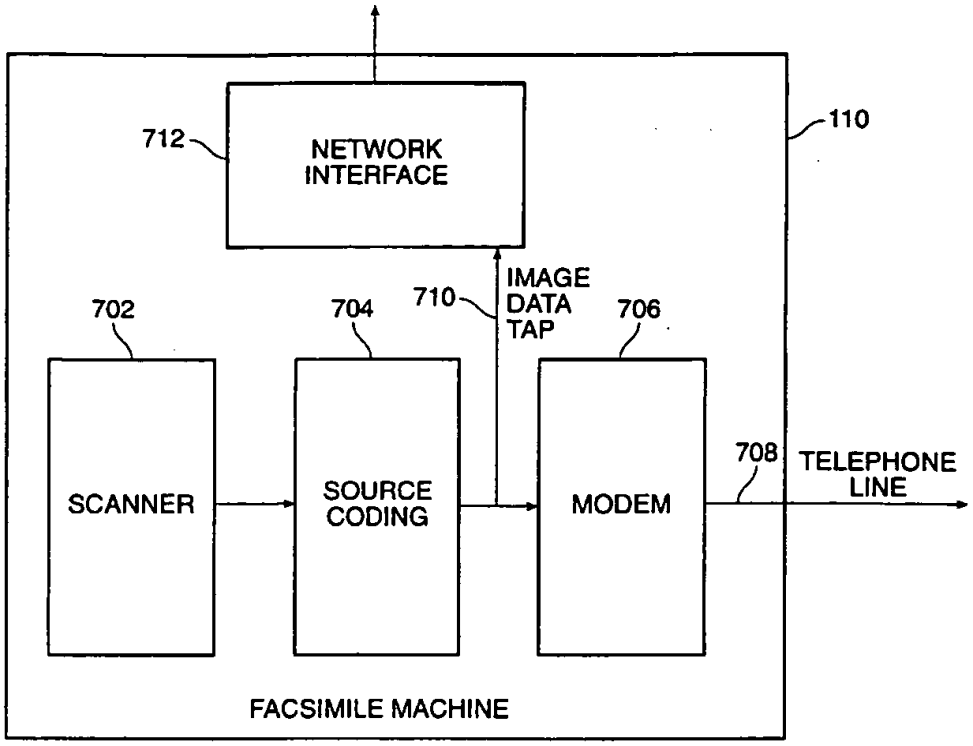

712
NETWORK INTERFACE
110
IMAGE DATA TAP
710
702
704
706
SCANNER
SOURCE CODING
MODEM
708
TELEPHONE LINE
FACSIMILE MACHINE

FIG. 7

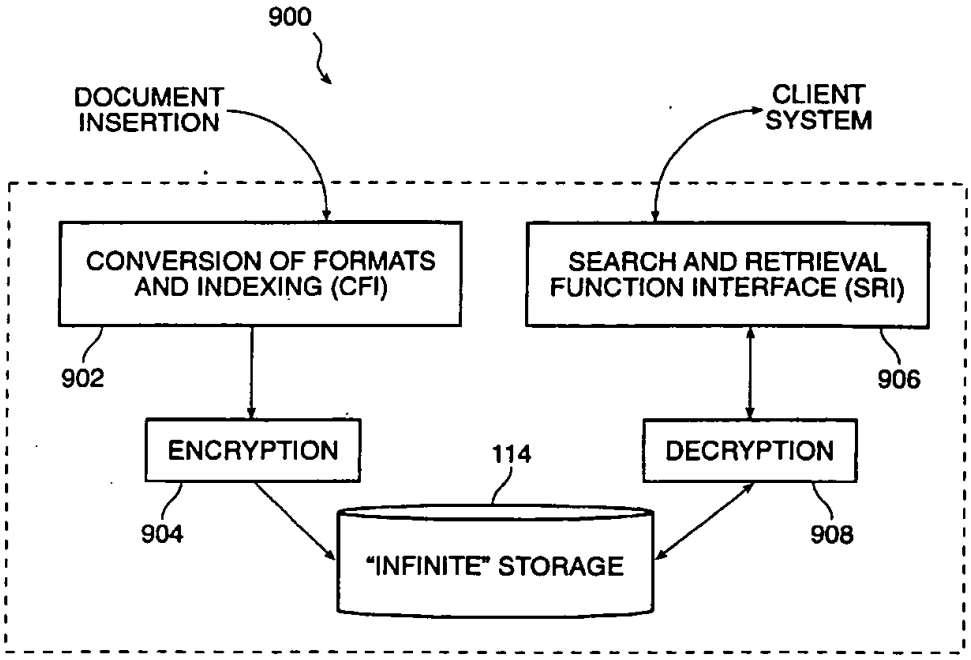

900
DOCUMENT INSERTION
CLIENT SYSTEM
CONVERSION OF FORMATS AND INDEXING (CFI)
SEARCH AND RETRIEVAL FUNCTION INTERFACE (SRI)
902
906
ENCRYPTION
DECRYPTION
114
904
908
"INFINITE" STORAGE

FIG. 9

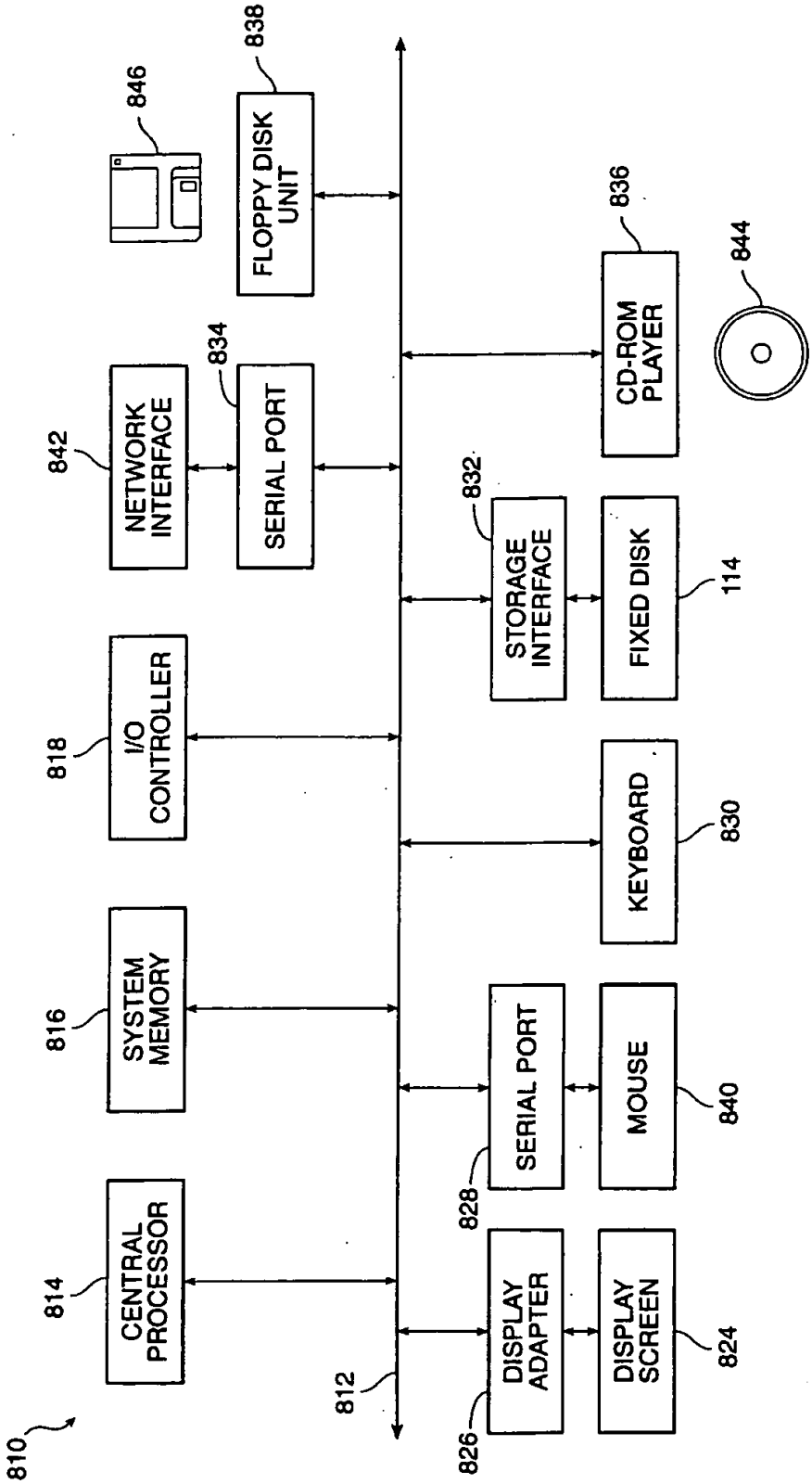

810
812
814
CENTRAL PROCESSOR
816
SYSTEM MEMORY
818
I/O CONTROLLER
826
DISPLAY ADAPTER
824
DISPLAY SCREEN
828
SERIAL PORT
840
MOUSE
830
KEYBOARD
832
STORAGE INTERFACE
114
FIXED DISK
836
CD-ROM PLAYER
844
842
NETWORK INTERFACE
834
SERIAL PORT
838
FLOPPY DISK UNIT
846

FIG. 8

AUTOMATIC AND TRANSPARENT DOCUMENT ARCHIVING

STATEMENT OF RELATED APPLICATIONS

The present application is related to the subject matter of the application titled, "DOCUMENT MANAGEMENT SYSTEM" co-assigned with the present application and filed on the same day. The contents of the "DOCUMENT MANAGEMENT SYSTEM" application are herein incorporated by reference for all purposes.

BACKGROUND OF THE INVENTION

The present invention relates to a document management system and more particularly to providing automatic archiving to standard office equipment.

With the rapid development of storage system technology, the cost of storing an image of a sheet of paper on digital media has become less than the cost of printing and storing the sheet of paper itself. Digital document storage also facilitates later electronic search and retrieval and raises the possibility of automatic filing of documents.

Until now, systematic digital document storage has required user discipline to scan in each and every document for the express purpose of archiving. Work has been done to make stand-alone scanners less expensive, easier to use, and more compact. However, the user must still 1) remember that a document should be scanned, 2) locate a scanner, 3) bring the document to the scanner, and 4) operate the scanner. However, scanning occurs constantly in the office environment in the contexts of copying and faxing.

SUMMARY OF THE INVENTION

The present invention provides an automatic archiving system that makes document archiving largely transparent to the user. In one embodiment, documents scanned in or printed during the course of office equipment operation are automatically archived. For example, an office local area network (LAN) may interconnect a copier, a printer, a facsimile machine, and a document management workstation. Whenever, a document is copied, printed, or faxed, a document image is archived by the document management workstation without further user intervention. A single user command results in the document being copied and archived, printed and archived, or faxed and archived.

In accordance with a first aspect of the invention, a method for processing document images includes steps of receiving a single user input command and performing certain steps in response to the single user input command. The steps include scanning a document image to collect image data, printing the document image based on the image data, and sending the image data to an archiving system for storage.

In accordance with a second aspect of the invention, a method for printing and archiving documents includes steps of receiving a single user command requesting that a document be printed, printing the document in response to the single user command, and archiving image data representing the document in response to the single user command.

In accordance with a third aspect of the invention, a method for archiving documents to be faxed includes steps of receiving a single user command indicating that a document is to be faxed, scanning the document to be faxed in response to the single user command, transmitting first image data representing the document as scanned to a remote location via a public telephone network, and

archiving, in response to the single user command, second image data representing the document as scanned in the scanning step.

In accordance with a fourth aspect of the invention, a computer installation includes a digital copier that scans in documents to be copied, a printer that prints documents, a computer system controlling a long-term storage medium, and a network interconnecting the digital copier, the printer, and the computer system. The digital copier relays image data representing the documents to be copied to the computer system for storage on the long-term storage medium. The printer, or a printer server controlling the printer, or a computer system initiating a command to print relays image data representing printed documents to the computer system for storage on the long-term storage medium.

In accordance with a fifth aspect of the invention, a digital copier includes a scanner that generates image data representing a document to be copied, an image processing unit that processes the image data to correct imaging errors introduced by the scan engine, a printer that copies the document responsive to the image data as processed by the image processing unit, and an image data tap that relays the image data to a storage system for archiving.

A further understanding of the nature and advantages of the inventions herein may be realized by reference to the remaining portions of the specification and the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts an office machine network implementing automatic document archiving in accordance with one embodiment of the present invention.

FIG. 2 depicts a portion of a copier control interface.

FIG. 3 depicts a top-level diagram of a digital copier implementing automatic document archiving in accordance with one embodiment of the present invention.

FIG. 4 depicts alternative signals usable for extracting horizontal synchronization data from a digital copier in accordance with one embodiment of the present invention.

FIG. 5 depicts a printer interface.

FIG. 6 depicts a facsimile machine interface.

FIG. 7 depicts a facsimile machine modified for automatic archiving in accordance with one embodiment of the present invention.

FIG. 8 depicts a computer system usable for implementing elements of the present invention.

FIG. 9 depicts a software architecture for operating a document image database in accordance with one embodiment of the present invention.

DESCRIPTION OF SPECIFIC EMBODIMENTS

Overall Architecture For Automatic Archiving

FIG. 1 depicts an office machine network implementing automatic document archiving in accordance with one embodiment of the present invention. A network **100** may be implemented in any way, e.g., an Ethernet. Network **100** interconnects a representative client system **102**, a print server **104**, a special digital copier **106**, a document management workstation **108**, and a special facsimile machine **110**. Print server **104** controls printing on a representative printer **112** at the request of client system **102** and relays document image data characterizing to document management workstation **108** for archiving. Digital copier **106** copies documents and transmits image data obtained during the course of copying to document management workstation

108 for archiving. Similarly, facsimile machine 110 captures image data during the course of sending and receiving documents and transmits the image data to document management workstation 108 for archiving. Document management workstation 108 collects the document image data collected from all of the office equipment and maintains an archive on a disk storage unit 114. Client system 102 may browse this archive.

The configuration of network 100 is of course only representative. For example, automatic archiving of documents may be implemented with only one or two types of office machine instead of the depicted types. Also, functionality of one or more units shown in FIG. 1 may be combined into the same unit or divided among many units.

Automatic Archiving of Copied Documents

In accordance with the present invention, digital copier 106 transparently archives documents that are copied. FIG. 2 depicts a simplified representation of a portion of a copier control interface 200 usable with digital copier 106. Copier control interface 200 includes a numeric keypad 202, an Enter key 204, and a Copy/Start key 206. Copier control interface 200 may be implemented using, e.g., a touch pad, touch screen, mechanical buttons, etc. Controls for paper size, copy darkness, copy contrast, paper size, and magnification/reduction ratio are not important to the present invention and are thus omitted.

In accordance with one embodiment of the present invention, activation of Copy/Start key 206 is sufficient to initiate both copying of a document and archiving of an image of the document. The user positions the document, e.g., in a document feeder (not shown), and then enters a personal access code on numeric keypad 202 finishing access code entry by depressing Enter key 204. Depressing Copy/Start key 206 represents a single user command that is interpreted by digital copier 106 to request both copying and archiving. Thus by copying, the user achieves both copying and archiving. In one embodiment, the user may enter a lock-out code to inhibit archiving, for instance, for privacy-protection purposes.

Details of the hardware for the copying and archiving processes will be made clearer with reference to FIGS. 3–5.

FIG. 3 depicts a top-level diagram of digital copier 106 implementing automatic document archiving in accordance with one embodiment of the present invention. Digital copier 106 includes a scanner engine 302, a print engine 304, a controller 306, a touch screen 308, and an internal disk storage unit 310. Controller 306 includes a DRAM unit 312, an LZ image compressor 314, a CPU 316, an IDE controller 318, a SCSI controller 320, and a network interface 321. A bus 323 interconnects the controller elements. Scanner engine 302 includes a scanner 302A and an image processing unit 302B. A video bus 324 interconnects scanner engine 302 and print engine 304. An image data tap 326 provides controller 306 with access to image data transferred over video bus 324. Controller 306 also takes advantage of an HSYNC signal 406 and a VSYNC signal 410 generated within print engine 304.

Digital copier 106 accepts a document 326 and prints a copy 328 upon depression of Start/Copy key 206. Scanner 302A captures an image of document 326 and transmits the image to image processing unit 328. Image processing unit 328 operates to remove distortion inherent in the scanning process. The output of the image processing unit is preferably in a format where 8 bits represent the grey-scale level of a pixel, there are 4380 active pixels per line, and there are 3380 active lines per frame or document page. There is a 10 pixel blanking period before and after each active line, making the total number of pixels per line, 4400. Similarly, there is a 10 line blanking period before and after every frame, making the total number of lines in a frame 3400. Of course, these parameters are only design choices.

This pixel data is forwarded from image processing unit 302B to print engine 304 for printing. The data rate over video bus 324 is preferably 20 MHz. Controller 306 monitors video bus 324 via image data tap 326 to receive the same pixel data. Although, it would be possible to monitor the pixel data prior to image processing unit 302B, the advantage to monitoring on video bus 324 is that image processing unit 302B is tightly coupled to scanner 302 and can monitor and correct for errors inherent in the scanning process.

Controller 306 performs overall control functions for digital copier 106 including the archiving functions. CPU 316, an Intel 80960 CF microcontroller, operates the control program for the operation of digital copier 106. Image data is often transferred into controller 306 at a faster rate via image data tap 326 than the image data can be archived. Accordingly, DRAM unit 312, preferably incorporating 8 to 72 MB of DRAM, acts as a buffer for image data. This allows printing of the copy to continue without interruption by the archiving process.

To save on storage space and facilitate faster data transfer across network 100, LZ image compressor 314 may compress the image data prior to archiving in accordance with the Lempel-Ziv image compression format. Of course, any image compression format may be chosen in accordance with the invention. With each block of image data to be archived, controller 306 incorporates the user ID data received from touch screen 308.

The actual archiving of document images may occur either locally or remotely. Controller 306 may maintain the archive on disk storage unit 310, in which case the image data will be transferred via IDE controller 318. The archive may also be maintained either internally or externally on SCSI drives to which image data is transferred via SCSI controller 320. Note, that if the archive is maintained on disk storage unit 310, or a disk drive accessible via SCSI controller 320, digital copier 106 will absorb some or all of the functionality of document management workstation 108. If the archive is maintained on document management workstation 108, network interface 321 sends the image data there via network interface 100 along with the user ID data for each particular document. Typically, LZ image compressor 314 is used in applications where documents are archived locally as opposed to remotely.

FIG. 4 depicts signals transferred over video bus 324 and image data tap 326 in accordance with one embodiment of the present invention. A pixel data line 327 carries the image data generated by image processing unit 302B is in a format to drive a laser diode input port 402 of print engine 304. Each pixel includes 8 bits.

Print engine 304 operates in accordance with well-known laser xerography principles and incorporates a laser diode that varies in illumination intensity responsive to the document image to be printed. The 8 bits input to laser diode input port 402 include 3 bits modulating the intensity of illumination of the laser diode and 5 bits modulating the width of illumination pulses. These pixels transfer over a pixel data line 327 at a 20 MHz rate. In the preferred embodiment, the image data presented at laser diode input port 402 is directly relayed to controller 306 via image data tap 326.

The beam output of the laser diode passes through a system of lens and mirrors that generates the horizontal scanning action to sweep the beam over a rotating xero-

graphic drum, thereby recreating the document image as a charge pattern on the drum. Typically, the rotation of a polygonal mirror tracks the scanning action. To assure the highest quality of reproduction, printing requires careful synchronization between the constituent parts of the scanner **302A**, image processing unit **302B** and the Print Engine **304**. This synchronization is signalled using the horizontal and vertical video synchronization signals, lines **404**, **406**, **408**, and **410**. All of these signals are interrelated in terms of synchronization to the motion inherent in the rotating polygonal mirror which provides faster scanning in the print engine, and in terms of the scanner **302A**. In some embodiments, the timing may be sourced by the print engine **304**, and circuitry in image processing unit **302B** is phase-locked to that timing. In an alternate embodiment, image processing unit **302B** may provide the master timing to the print engine **304**, which subsequently phase-locks or otherwise synchronizes its mechanical motion to these source signals. This embodiment is illustrated in FIG. **4**. Those skilled in the art will recognize the various trade-offs in product design originating from alternative selections of the master reference timing sources used for generating the synchronization signals in the system of FIG. **4**, without losing the generality of obtaining access to the video bus **324**.

Horizontal synchronization signal (HSYNC) **406** for the image data may be obtained from print engine **304** in many ways. One technique is to position an optically sensitive sensor at a point within the optical system where the scanning action of the beam may be monitored. A pulse is generated every time the beam reaches an extremity of the scan. Depending on the particular design of the optical system, this pulse rate may be a harmonic or subharmonic of the actual horizontal synchronization rate.

Another technique is to attach an optical encoder to the motor that rotates the polygonal mirror. By monitoring the motor operation in this, or some other way, horizontal synchronization signal **406** may be derived. It is also possible to derive horizontal synchronization signal **406** from the control signal which drives the motor.

A vertical synchronization control **408** also incorporates information about the scanning action of scanner **302A**. To assure high quality reproduction, the movement of paper through print engine **304** takes this vertical synchronization control information into account. Vertical synchronization signal **410** may be obtained from print engine **304** in a variety of ways. One way is to tap off an internal signal that gates a new sheet of paper to pass underneath the xerographic drum.

The horizontal and vertical synchronization signals **406** and **410** are used to assure that only valid pixels are archived. Data indicating the number of lines on each page and the line length in pixels is also archived with the pixels. Thus, when the document is retrieved for printing later, printing of the document inherently takes advantage of the information present on vertical synchronization control **408** and horizontal synchronization control **404**, namely image position within a page, and more particularly, the size of paper printed upon. Furthermore, the document image has already been subject to sophisticated image processing by IPU **322**. The final printed document is therefore a very high quality reproduction.

The present invention is however not restricted to capturing image data for archiving at the output of an image processing system such as IPU **322**. Whether or not such an image processing system is present, image data for archiving may be captured at the output of scanner **302A**.

Automatic Archiving of Printed Documents

FIG. **5** depicts a simplified representation of a user interface screen **500** for operating a printer. A user interface screen such as screen **500** is generally displayed by client system **102** whenever the user requests printing of a document. A list **502** of options permits the user to select whether the full document is to be printed, only a specified range of pages, or only text that has been highlighted using a pointing and selection device such as a mouse. If a range of pages is to be specified, a field **504** is used to enter the range of page numbers. A field **506** permits the user to specify a number of document copies to be printed. A "current printer" field **508** identifies the printer that will be used to print the document. Activation of a "Close" screen button **510** dismisses user interface screen **500**.

In the prior art, activation of a "Print" screen button **512** causes a document to be printed. In accordance with one embodiment of the present invention, activation of "Print" button **512** represents a single user command to both print and archive the document. Client system **102** sends the document to be printed to print server **104** which runs print spooling software for writing to printer **112**. The print spooling software maintains a queue of print jobs to run. The document may be sent to print server **104** in any format, such as text, TIFF, GIF, postscript, etc. Printer **112** will typically accept postscript input but other printer configurations are also possible. If the format of transmission by client system **102** is different from the format accepted by printer **112**, printer server **104** will also perform format conversion.

In accordance with the invention, each document handled by print spooling software is sent to document management workstation **108**. The document may be transmitted in either the format generated by client system **102** or any format to which printer server **104** is able to convert. The document may be sent to document management workstation **108** with data identifying the current user of client system **102**. Thus, archiving becomes an incidental consequence of the printing process. Previously printed documents are retrievable.

Automatic Archiving of Faxed Documents

FIG. **6** depicts a simplified representation of a facsimile machine user interface **600**. A display screen **602** provides the user with prompts. A keypad **604** allows for entry of a telephone number to which a document is to be faxed. Depression of a start button **606** causes a document to be scanned into a memory within a facsimile machine or, if a document has already been scanned into memory and a telephone number has been entered, causes the document to be faxed to the entered telephone number. Depression of a stop button **608** causes faxing to cease. In accordance with the present invention, depression of start button **606** at the appropriate time represents a single user command to both fax and archive a document.

FIG. **7** depicts facsimile machine **110** modified for automatic archiving in accordance with one embodiment of the present invention. Facsimile machine **110** incorporates a scanner **702** for scanning a document to be faxed and storing a binary pixel representation of the document in a memory (not shown) internal to scanner **702**. A source coding unit **704** compresses the gray scale pixel data in accordance with facsimile transmission standard, e.g., Group III. A modem **706** modulates a carrier with the compressed data output of source coding unit **704** in accordance with the relevant facsimile transmission standard to generate a modulated signal to output on a telephone line **708**.

In accordance with one embodiment of the present invention, an image data tap **710** transmits the compressed data output of source coding unit to a network interface **712**.

Network interface **704** in turn sends the compressed data output representing a document to document management workstation **108** for archiving. In alternative embodiment, image data tap **710** is instead positioned at the output of scanner **702**.

Optionally, the user enters a code number on keypad **604** to identify himself or herself. This information is also sent to document management workstation **108** to be stored with the faxed document. Alternatively, the identity of the user of facsimile machine **110** is already know in some other way.

Thus, every document that is faxed is also archived without further user input. This provides yet another source of document images for the archive maintained by document management workstation **108**.

Document Management Workstation

FIG. **8** depicts a computer system **810** usable for implementing any one or more of client system **102**, print server **104**, or document management workstation **108** in accordance with one embodiment of the present invention. Computer system **810** includes bus **812** which interconnects major subsystems such as central processor **814**, system memory **816**, input/output (I/O) controller **818**, external device such as display screen **824** via display adapter **826**, serial port **828**, keyboard **830**, fixed disk drive **114** via a storage interface **832**, a serial port **834**, a CD-ROM player **836**, and a floppy-disk drive **838**. A mouse **840** may connect to serial port **828**. A network interface **842** for connection to network **100** may connect to serial port **834**. CD-ROM player **836** receives a CD-ROM disk **844**. Floppy-disk drive **838** receives a floppy disk **846**. Many other devices or subsystems (not shown) may be connected in a similar manner. Also, it is not necessary for all of the devices shown in FIG. **8** to be present to practice the present invention, as discussed below. The devices and subsystems may be interconnected in different ways from that shown in FIG. **8**. The operation of a computer system such as that shown in FIG. **8** is readily known in the art and is not discussed in detail in the present application. Source code to implement elements of the present invention may be operably disposed in system memory **814** or stored on storage media such as fixed disk **830**, floppy disk **846**, or CD-ROM **844**.

FIG. **9** depicts a software architecture **900** for operating a document image database in accordance with one embodiment of the present invention. Preferably, the software architecture operates on document management workstation **108**. Documents to be archived are received by a CFI (conversion of formats and indexing) module **902** from any one of digital copier **106**, print server **104**, or facsimile machine **110**. CFI module **902** converts the format of the received document to a desired format for storage. CFI module **902** may, e.g., receive the data in the 8 bit pixel format discussed in reference to digital copier **106** along with synchronization information useful for high quality reproduction. These desired formats include, e.g., postscript, 8 dpi GIFF, 72 dpi GIFF, 400 dpi TIFF, and plain text. Converting from a graphic format to plain text includes the process of optical character recognition. CFI module **902** also applies an indexing system to the documents to be archived. For plain text documents, the index information generated for the document facilitates later full text searching. If the identity of the user is available, this will also form a part of the indexing information for the document to facilitate later retrieval by the user.

For each document to be archived, a separate HTML document is generated with an iconic form of the images (8 dpi GIF) to be archived and keywords from a text document that is stored. One set of HTML index pages is maintained for each user. Each HTML index page in the set provides a different view of the images in a user's database. For example, one page provides a sequential listing of every saved image, including the document icons. Another page provides a sequential listing of all the documents which shows an ASCII summary of each image without showing the icons. CFI module **902** performs the necessary conversions.

An encryption module **904** optionally encrypts the document to be archived and its HTML counterpart with an encryption key particular to the user. This way only the user and other authorized parties may retrieve the encrypted document. The encrypted documents are stored on disk storage unit **114**.

An SRI module (search and retrieval interface) module **906** provides access to the document archive maintained on disk storage unit **114**. Decryption system **908** is provided as an option for encrypted documents. SRI module **906** is implemented as an HTTP daemon operating on document management workstation **108**. SRI module **906** is preferably the only search and retrieval path to the document archive. This restricted form of access allows log access information to be maintained. SRI module **906** processes HTTP requests from client system **102** to browse HTML documents on disk storage unit **114**, or to search and retrieve the archived documents. Full text search is implemented with a WAIS engine or other search engine (e.g., VERIFY, EXCALIBUR, FULCRUM) implemented with SRI module **906**. Queries are entered by the user in an HTML form and transmitted to the search engine using a CGI script running in SRI module **906**. An initial user request should incorporate a password to authorize decryption by decryption system **908**.

To facilitate user interaction with SRI module **906**, client system **102** preferably runs a Java-capable world wide web browser such as Netscape Navigator obtainable from Netscape Communications of Mountain View, California. Java programs may be downloaded from SRI module **906** to perform functions such as searching or display and printing of particular document formats.

Of course, the storage and retrieval architecture discussed above is only representative. The co-filed application "DOCUMENT MANAGEMENT SYSTEM" includes many other applications of an automatic archiving system.

In the foregoing specification, the invention has been described with reference to specific exemplary embodiments thereof. It will, however, be evident that various modifications and changes may be made thereunto without departing from the broader spirit and scope of the invention as set forth in the appended claims. Many such changes or modifications will be readily apparent to one of ordinary skill in the art. For example, digital copier **106** may also act as a printer for client system **102**. Also, the network **100** may include connections over a WAN or the Internet, allowing remote archiving and retrieval of documents. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense, the invention being limited only by the provided claims and their full scope of equivalents.

What is claimed is:

1. A method for providing unconscious capture archiving of documents in an automated office environment, said office environment further comprising:

a network;

at least one document management workstation, said document management workstation having at least one of a plurality of databases, said at least one database disposed to receive electronic copies of said documents for archiving;

a plurality of client computers, said client computers and said document management workstation being interconnected by said network, said plurality of client computers in communication with said document management workstation over said network to receive electronic copies of said documents from said document management workstation; and

at least one of a plurality of office machines, said at least one office machine having a scanning engine and a printing engine, said scanning engine being operatively disposed to receive at least one of a plurality of documents to produce electronic document image data, said printing engine being operatively disposed to produce hardcopy of said electronic document image data, said office machine being interconnected to said document management workstation to transmit said electronic document image data to said document management workstation; said method comprising the steps:

presenting to a user at said at least one office machine a plurality of options from which said user can make a selection;

receiving from said user said at least one of a plurality of documents;

receiving from said user a single user input command, said single user input command responsive to said plurality of options, and thereupon;

responsive to said single user input command, performing a scanning operation on said document to form said electronic document image data, said scanning operation being performed by said scanning engine;

responsive to said single user input command, causing said electronic document image data to be transmitted to said document management workstation over said interconnection between said office machine and said document management workstation;

responsive to said single user input command, printing said document image based on said image data, said printing operation being performed by said printing engine; and

causing said image data to be stored in said archiving system to perform said unconscious capture archiving, wherein said aforementioned steps are carried out without further input from said user notwithstanding said single user input command, wherein said aforementioned steps capture electronic document images of each and every document inserted into said office machine.

2. The method of claim 1 further comprising the step of:

performing image processing on said image data to form processed image data, and thereupon, performing said printing step and said transmitting step on said processed image data.

3. The method of claim 1 further comprising the step of:

performing image processing on said image data to form processed image data, and thereupon, performing said printing step on said processed image data.

4. The method of claim 1 further comprising the steps of:

receiving user input data identifying a user;

causing said user input data to be stored in said archiving system with said image data.

5. The method of claim 1 wherein said printing engine further comprises a laser print engine having a laser diode, said image data comprising signals to said laser diode of said laser print engine.

6. The method of claim 1 further comprising the step of:

providing a user interface for browsing stored document images in said archiving system.

7. The method of claim 1 wherein said image data is a page description language file, e.g., Postscript data.

8. The method of claim 1 wherein said image data is in TIFF format.

9. The method of claim 1 wherein said image data is text data.

10. The method of claim 1 further comprising the step of:

encrypting said image data.

11. The method of claim 1, wherein said at least one of said plurality of office machines is a digital copier.

12. The method of claim 1, wherein said at least one of said plurality of office machines is a facsimile machine.

13. A method for providing unconscious capture archiving and printing of documents in an automated office environment, said office environment further comprising:

a network;

at least one document management workstation, said document management workstation having at least one of a plurality of databases, said at least one database disposed to receive electronic copies of said documents for archiving;

a plurality of client computers, said client computers and said document management workstation being interconnected by said network, said plurality of client computers in communication with said document management workstation over said network to receive electronic copies of said documents from said document management workstation; and

at least one of a plurality of office machines, said at least one office machine having a printing engine, said printing engine being operatively disposed to produce hardcopy of electronic document image data, said office machine being interconnected to said document management workstation to transmit said electronic document image data to said document management workstation; said method comprising the steps:

receiving from said user a single user input command, said single user input command indicating a particular document in said plurality of documents to be printed by said office machine, and thereupon;

responsive to said single user input command, printing said document image based on said image data, said printing operation being performed by said printing engine;

responsive to said single user input command, causing said electronic document image data to be transmitted to said document management workstation over said interconnection between said office machine and said document management workstation; and

causing said image data to be stored in said archiving system to perform said unconscious capture archiving, wherein said aforementioned steps are carried out without further input from said user notwithstanding said single user input command, wherein said aforementioned steps capture electronic document images of each and every document printed by said office machine.

14. The method of claim 13 further comprising the step of:

providing a user interface for browsing stored document images in said archiving system.

15. The method of claim 13 wherein said image data is a page description language file, e.g., Postscript data.

16. The method of claim 13 wherein said image data is in TIFF format.

17. The method of claim 13 wherein said image data is text data.

18. The method of claim 13 further comprising the step of:

encrypting said image data.

19. A computer system for providing unconscious capture archiving of documents, said computer system comprising:

a digital copier, said digital copier operatively disposed to present to a user a plurality of options from which said user can make a selection, receive from said user at least one of a plurality of documents, receive from said user a single user input command, said single input command responsive to said plurality of options, and responsive to said single user input command, perform a scanning operation on said at least one of a plurality of documents to form image data;

a printer that prints documents;

a computer having a long-term storage medium; and

a network interconnecting said digital copier, said printer, and said computer, wherein said digital copier relays said image data representing said documents to be archived to said computer for storage on said long-term storage medium, and said printer relays image data representing documents to be printed to said computer for storage on said long-term storage medium,

wherein said image data to be stored in said long-term storage medium is relayed to said computer from said copier or said printer by said network without further input from said user notwithstanding said single user input command, wherein said image data to be stored in said long-term storage medium is captured from each and every document inserted into said digital copier or printed by said printer.

20. The computer system of claim 19 further comprising:

a facsimile machine that scans in documents to be faxed to a remote location, said network also connecting to said facsimile machine, and said facsimile machine relaying image data of faxed documents to said computer for storage on said long-term storage medium.

21. The system of claim 19 wherein said image data is a page description language file, e.g., Postscript data.

22. The system of claim 19 wherein said image data is in TIFF format.

23. The system of claim 19 wherein said image data is text data.

24. The system of claim 19 wherein said image data is encrypted.

25. A digital copier comprising:

a scanning engine, said scanning engine operatively disposed to receive at least one of a plurality of documents to produce image data;

an image processing unit that processes said image data to correct imaging errors introduced by said scanning engine;

a printing engine, said printing engine being operatively disposed to produce hardcopy of said image data;

an image data tap that relays said image data to a storage system to perform unconscious capture archiving, wherein responsive to receiving from said user at least one of a plurality of documents and receiving from said user a single user input command, said single input command entered by said user responsive to a plurality of options displayed to said user, said scanning engine performs a scanning operation on said document to form said image data, said image tap relays said image data to said document storage system, and said printing engine prints a document based on said image data, wherein said scanning engine, image processing unit, printing engine and image data tap function without further input from said user notwithstanding said single user input command, wherein said scanning engine, image processing unit, printing engine and image data tap capture image data of each and every document inserted into said digital copier.

26. The digital copier of claim 25 wherein said image data tap relays image data processed by said image processing unit to said storage system.

27. The digital copier of claim 25 wherein said image data includes a horizontal synchronization signal.

28. The digital copier of claim 25 wherein said printing engine comprises a laser printing engine.

29. The digital copier of claim 25 wherein said laser printing engine comprises a laser diode for generating an image signal, wherein illumination by said laser diode is controlled by said image data, said image data comprising successive digital words relayed by said image data tap.

30. The digital copier of claim 25 wherein each of said digital words comprises at least one bit modulating an intensity of illumination of said laser diode and at least one bit modulating a pulse width of illumination of said laser diode.

31. A method for providing unconscious capture archiving and printing of documents in an automated office environment in which electronic documents are transferred over a network coupling at least one device with a printing engine to at least one document management workstation having at least one database disposed to receive electronic copies of said documents for archiving, the method comprising:

receiving an electronic document image data being transmitted over the network in response to the electronic document being printed by a print engine in response to a single user input command; and

causing said image data to be stored in the at least one database to perform the unconscious capture archiving, wherein the aforementioned steps are carried out without further input from the user notwithstanding the single user input command, and the aforementioned steps capture electronic document images of documents printed and transferred over the network.

32. A system for providing unconscious capture archiving of documents, said system comprising:

a computer having a long-term storage medium; and

a network interconnecting the computer with devices that transfer image data onto the network via print or copy commands and relay each image data representing documents in response to a single user input command to be archived by the computer for storage on the long-term storage medium;

wherein the image data to be stored in the long-term storage medium is relayed to the computer without further input from the user notwithstanding the single user input command, and the image data to be stored in said long-term storage medium is captured from documents being copied or printed without interruption of the copy on the print commands respectively.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 5,978,477
DATED : November 2, 1999
INVENTOR(S) : Jonathan J. Hull, Mark Peairs, John Cullen, Michael Baxter

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 3,
Line 58, change "326" to -- 328 --.
Line 59, change "328" to -- 330 --.
Line 60, change "326" to -- 328 --.
Line 61, change "328" to -- 302B --.
Line 62, change "328" to -- 302B --.

Column 4,
Line 12, change "302" to -- 302A --.
Line 44, delete "interface".
Line 51, delete "is".

Column 5,
Line 61, change "322" to -- 302B --.
Line 65, change "322" to -- 302B --.

Column 7,
Line 1, change "704" to -- 712 --.
Line 3, after "In" add -- an --.
Line 10, change "know" to -- known --.
Line 40, change "814" to -- 816 --.
Line 41, change "830" to -- 114 --.

Signed and Sealed this

Second Day of April, 2002

Attest:

Attesting Officer

JAMES E. ROGAN
Director of the United States Patent and Trademark Office